

R E M A R K S

Independent claims 1, 10 and 14 have been amended to limit them to the mol ration disclosed on page 11, lines 14-22, where the advantages of this feature are described. They have also been limited with respect to the maximum percentage of $\text{MgO}+\text{CaO}+\text{BaO}+\text{SrO}+\text{ZnO}$, and the density parameter.

Particularly as now amended, the claims are respectfully submitted neither to be anticipated under 35 U.S.C. 102 by the patents of record, nor to be obvious therefrom under Sec. 103.

In the claimed alkali-free glass, the contents of BaO , SrO , $\text{BaO}+\text{SrO}$, and $\text{MgO}+\text{CaO}+\text{BaO}+\text{SrO}+\text{ZnO}$ are in the range of 0.1-2%, 0-4%, 0.1-6%, and 5-12%, respectively, and the density is not higher than $2.40\text{g}/\text{cm}^3$. If the alkali-free glass having such a low density is used as a glass substrate of a mobile or portable device such as a mobile telephone or a notebook-type personal computer, the device is reduced in weight. In addition, the glass substrate is prevented from sagging due to its own weight. Therefore, it is easy to handle the glass substrate during production of the device.

The content of Al_2O_3 is 10-19% and the ratio of $(\text{CaO}+\text{BaO}+\text{SrO})/\text{Al}_2\text{O}_3$ falls within a range between 0.9 and 1.2 in

mol ratio. This improves the devitrification resistance. Specifically, the glass substrate for TFT-LCD is formed by a down-drawing method or a floating method. In particular, the glass substrate formed by the down-drawing method does not require polishing. Therefore, the production cost is lowered. However, in case where the glass substrate is formed by the down-drawing method, the glass is readily devitrified. Therefore, the glass is required to be excellent in devitrification resistance. The claimed glass is excellent in devitrification resistance and can easily be formed by the down-drawing method.

On the other hand, Miwa's glass in each of Examples 1, 3, 6, 7, and 10 has a density higher than 2.40g/cm^3 . Each of Examples 4 and 5 contains 19% or more Al_2O_3 . Furthermore, in each of Examples 2, 8, and 9, the ratio of $(\text{CaO}+\text{BaO}+\text{SrO})/\text{Al}_2\text{O}_3$ is smaller than 0.9 in mol ratio.

Thus, the claimed alkali-free glass is lower in density and superior in devitrification resistance as compared with Miwa and, therefore, is clearly distinguished from Miwa.

As to US patent 6,060,168 (Kohli), the claimed alkali-free glass has a density not higher than 2.40g/cm^3 . By inclusion of 0.1% or more BaO, the glass is improved in chemical resistance

and devitrification resistance. Such a glass is not disclosed in Kohli. In Kohli, each of Examples 1-7, 9, 10, and 12 has a density higher than 2.40g/cm^3 . Furthermore, each of Examples 8, 11 and 13-16 does not contain BaO. Kohli does not describe an alkali-free glass having a density not higher than 240g/cm^3 and excellent in chemical resistance and devitrification resistance. Therefore, the claims are respectfully submitted to distinguish patentably from Kohli.

As to Peuchert et al, it should be noted that the claimed alkali-free glass contains 2% or less BaO and has a density not higher than 2.40g/cm^3 . In contrast, the glass of Peuchert et al contains more than 3% BaO. The glass in each of Examples 1-15 has a density higher than 2.40g/cm^3 . Therefore, the claims are respectfully submitted to distinguish clearly from Peuchert et al.


Finally, as to EP 1070681A1 (Lautenschlager et al), in the claimed alkali-free glass, the contents of BaO, SrO, BaO+SrO, and MgO+CaO+BaO+SrO+ZnO are in the range of 0.1-2%, 0-4%, 0.1-6%, and 5-12%, respectively, and the density is not higher than 2.40g/cm^3 . In Lautenschlager et al, each of Examples 1, 3, 7-10, 12 contains more than 12% ZnO and each of Examples 2, 4-6, and 11 contains more than 4% SrO. Each of these glasses has a density higher than 2.40g/cm^3 . Therefore, the claims are

respectfully submitted to distinguish clearly from
Lautenschlager et al.

A sincere effort having been made to overcome all grounds
of rejection, favorable reconsideration and allowance of claims
1-16 are respectfully solicited.

Respectfully submitted,

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Enclosure: Marked-up copy of changes

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Amend claims 1, 10 and 14 to read as follows:--

1 (amended). 1. An alkali-free glass consisting essentially of, in mass percent, 58-70% SiO₂, 10-19% Al₂O₃, 6.5-15% B₂O₃, 0-2% MgO, 3-12% CaO, 0.1-[5]2% BaO, 0-4% SrO, 0.1-6% BaO+SrO, 0-5% ZnO, 5-[15]12% MgO+CaO+BaO+SrO+ZnO, 0-5% ZrO₂, 0-5% TiO₂, and 0-5% P₂O₅, containing substantially no alkali metal oxide, and having a density of [2.45] 2.40g/cm³ or less, an average coefficient of thermal expansion of $25 \times 10^{-7}/^{\circ}\text{C}$ - $36 \times 10^{-7}/^{\circ}\text{C}$ within a temperature range between 30 and 380°C, and a strain point not lower than 640°C, in which a ratio (CaO+BaO+SrO)/Al₂O₃ falls within a range between 0.9 and 1.2 in mol ratio.

10 (amended). A glass plate formed by an alkali-free glass consisting essentially of, in mass percent, 58-70% SiO₂, 10-19% Al₂O₃, 6.5-15% B₂O₃, 0-2% MgO, 3-12% CaO, 0.1-[5]2% BaO, 0-4% SrO, 0.1-6% BaO+SrO, 0-5% ZnO, 5-[15]12% MgO+CaO+BaO+SrO+ZnO, 0-5% ZrO₂, 0-5% TiO₂, and 0-5% P₂O₅, containing substantially no alkali metal oxide, and having a density of [2.45] 2.40g/cm³ or less, an average coefficient of thermal expansion of $25 \times 10^{-7}/^{\circ}\text{C}$ - $36 \times 10^{-7}/^{\circ}\text{C}$ within a temperature range between 30 and 380°C, and a strain point not lower than 640°C, in which a ratio (CaO+BaO+SrO)/Al₂O₃ falls within a range between 0.9 and 1.2 in mol ratio.

14. A liquid crystal display comprising a glass plate formed by an alkali-free glass consisting essentially of, in mass percent, 58-70% SiO₂, 10-19% Al₂O₃, 6.5-15% B₂O₃, 0-2% MgO, 3-12% CaO, 0.1-[5]2% BaO, 0-4% SrO, 0.1-6% BaO+SrO, 0-5% ZnO, 5-[15]12% MgO+CaO+BaO+SrO+ZnO, 0-5% ZrO₂, 0-5% TiO₂, and 0-5% P₂O₅, containing substantially no alkali metal oxide, and

having a density of [2.45] 2.40g/cm³ or less, an average coefficient of thermal expansion of $25 \times 10^{-7}/^{\circ}\text{C}$ - $36 \times 10^{-7}/^{\circ}\text{C}$ within a temperature range between 30 and 380°C, and a strain point not lower than 640°C, in which a ratio (CaO+BaO+SrO)/Al₂O₃ falls within a range between 0.9 and 1.2 in mol ratio.

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